

CLAIMS

We claim:

1. Method for operating a first node in a network including at least one second node, comprising the steps of:
 - establishing at said first node a coincident endpoint for an outer connection and an inner connection with respect to at least one second node;
 - responsive to receiving a nested packet from said second node on said outer connection, decapsulating said packet into a first packet and then performing source-in network address translation on said first packet; and
 - responsive to receiving a second packet at said inner connection, performing source-in network address translation on said second packet, and then encapsulating said second packet into a nested packet for communication on said outer connection to said second node.

18 2. The method of claim 1 wherein said first node comprises
19 an enterprise gateway and said first node a remote
20 client.

1 3. Method for managing connections within a communications
2 system, comprising the steps of:

3 configuring an outer connection;

4 communicating from a client to a gateway on said outer
5 connection a request to configure a secure inner
6 connection;

7 responsive to said request, initializing said gateway
8 to receive a future nested communication, including
9 obtaining a client address from a packet on said outer
10 connection;

11 starting said inner connection;

12 responsive to starting said inner connection,
13 propagating a network address translation rule from
14 said outer connection to said inner connection.

15 4. The method of claim 3, further comprising the step of:

16 further responsive to starting said inner connection,
17 encapsulating a packet outbound from said gateway first
18 in said inner connection and then in said outer
19 connection.

1 5. The method of claim 4, further comprising the steps of:

2 responsive to receiving a packet at said gateway,
3 determining if said packet has a security header;

4 responsive to said packet having said security header,
5 decapsulating said packet and saving any address
6 translation rule included within said packet; and

7 applying said address translation rule to said packet
8 and thereafter communicating said packet from said
9 gateway to said client.

1 6. The method of claim 5, further comprising the steps of:

2 iteratively executing said decapsulating step until a
3 resulting decapsulated packet no longer contains a
4 security header.

1 7. Method for enabling a local gateway to handle
2 dynamically assigned IP addresses from remote clients,
3 comprising the steps of:

4 assigning said IP address to a remote client;

5 automatically maintaining between said remote client
6 and said gateway nested connections with local
7 coincident endpoints.

1 8. The method of claim 7, wherein said nested connections
2 comprise an inner connection and an outer connection.

1 9. The method of claim 8, further comprising the steps of:

2 responsive to receiving a nested packet from said
3 client on said outer connection, decapsulating said

4 packet into a first packet and then performing source-
5 in network address translation on said first packet;
6 and

7 responsive to receiving a second packet at said inner
8 connection, performing source-in network address
9 translation on said second packet, and then
10 encapsulating said second packet into a nested packet
11 for communication on said outer connection to client.

1 10. System for operating a first node in a network
2 including at least one second node, comprising:

3 an inner connection;

4 an outer connection;

5
6 a local coincident endpoint for said outer connection
7 and said inner connection at said first node with
8 respect to at least one second node;

9 said first node being responsive to receiving a nested
10 packet from said second node on said outer connection

11 for decapsulating said packet into a first packet and
12 then performing source-in network address translation
13 on said first packet; and

14 said first node being further responsive to receiving a
15 second packet at said inner connection for performing
16 source-in network address translation on said second
17 packet, and then encapsulating said second packet into
18 a nested packet for communication on said outer
19 connection to said second node.

1 11. Method for extending virtual private network (VPN)
2 network address translation (NAT) to include support
3 for nested connections with coincident endpoints,
4 without requiring any special configuration for the
5 inner (nested) VPN connection, with respect to VPN NAT,
6 comprising the steps of:

7 configuring an outer connection with a VPN NAT rule;

8 communicating from a client to a gateway on said outer
9 connection a dynamically generated security association
10 request packet to configure a secure inner connection;

11 responsive to said request, initializing said gateway
12 to receive a future nested communication, including
13 obtaining a client address from said request packet on
14 said outer connection;

15 starting said inner connection;

16 responsive to starting said inner connection,
17 propagating said VPN NAT rule from said outer
18 connection to said inner connection.

1 12. The method of claim 11, further comprising the step of:

2 further responsive to starting said inner connection,
3 encapsulating a packet outbound from said gateway first
4 in said inner connection and then in said outer
5 connection.

1 13. The method of claim 12, further comprising the steps
2 of:

3 responsive to receiving a packet at said gateway,
4 determining if said packet has a security header;

5 responsive to said packet having said security header,
6 decapsulating said packet and saving any VPN NAT rule
7 included within said packet; and

8 applying said NAT rule to said packet and thereafter
9 communicating said packet from said gateway to said
10 client.

1 14. The method of claim 13, further comprising the step of:
2 iteratively executing said decapsulating step until a
3 resulting decapsulated packet no longer contains a
4 security header.

1 15. The method of claim 13, further comprising the step of:
2 supporting L2TP within said internal connection.

1 16. System for extending virtual private network (VPN)
2 network address translation (NAT) to include support
3 for nested connections with coincident endpoints,

4 without requiring any special configuration for the
5 inner (nested) VPN connection, with respect to VPN NAT,
6 comprising:

7 a gateway;

8 a client;

9 an inner connection for connecting said gateway and
10 said client;

11 an outer connection for connecting said gateway and
12 said client;

13 said outer connection being configured by said client
14 with a VPN NAT rule;

15 said outer connection for communicating from said
16 client to said gateway a dynamically generated security
17 association request packet to configure said inner
18 connection;

19 said gateway further responsive to said request for

20 initializing said gateway to receive a future nested
21 communication, including obtaining a client address
22 from said request packet on said outer connection;

23 said gateway further responsive to starting said inner
24 connection for propagating said VPN NAT rule from said
25 outer connection to said inner connection.

1 17. A program storage device readable by a machine,
2 tangibly embodying a program of instructions executable
3 by a machine to perform method steps for operating a
4 first node in a network including at least one second
5 node, said method steps comprising:

6 establishing at said first node a coincident endpoint
7 for an outer connection and an inner connection with
8 respect to at least one second node;

9 responsive to receiving a nested packet from said
10 second node on said outer connection, decapsulating
11 said packet into a first packet and then performing
12 source-in network address translation on said first
13 packet; and

14 responsive to receiving a second packet at said inner
15 connection, performing source-in network address
16 translation on said second packet, and then
17 encapsulating said second packet into a nested packet
18 for communication on said outer connection to said
19 second node.

1 18. A computer program product or computer program element
2 for operating a first node in a network including at
3 least one second node according to the steps of:

4 establishing at said first node a coincident endpoint
5 for an outer connection and an inner connection with
6 respect to at least one second node;

7 responsive to receiving a nested packet from said
8 second node on said outer connection, decapsulating
9 said packet into a first packet and then performing
10 source-in network address translation on said first
11 packet; and

12 responsive to receiving a second packet at said inner
13 connection, performing source-in network address

14 translation on said second packet, and then
15 encapsulating said second packet into a nested packet
16 for communication on said outer connection to said
17 second node.

1 19. A program storage device readable by a machine,
2 tangibly embodying a program of instructions executable
3 by a machine to perform method steps for managing
4 connections within a communications system, said method
5 steps comprising:

6 configuring an outer connection;

7 communicating from a client to a gateway on said outer
8 connection a request to configure a secure inner
9 connection;

10 responsive to said request, initializing said gateway
11 to receive a future nested communication, including
12 obtaining a client address from a packet on said outer
13 connection;

14 starting said inner connection;

15 responsive to starting said inner connection,
16 propagating a network address translation rule from
17 said outer connection to said inner connection.

1 20. The storage device of claim 19, said method steps
2 further comprising the step of:

3 further responsive to starting said inner connection,
4 encapsulating a packet outbound from said gateway first
5 in said inner connection and then in said outer
6 connection.

1 21. The storage device of claim 20, said method steps
2 further comprising the steps of:

3 responsive to receiving a packet at said gateway,
4 determining if said packet has a security header;

5 responsive to said packet having said security header,
6 decapsulating said packet and saving any address
7 translation rule included within said packet; and

8 applying said address translation rule to said packet

9 and thereafter communicating said packet from said
10 gateway to said client.

1 22. The storage device of 21, said method steps further
2 comprising the steps of:

3 iteratively executing said decapsulating step until a
4 resulting decapsulated packet no longer contains a
5 security header.

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